FIG.1

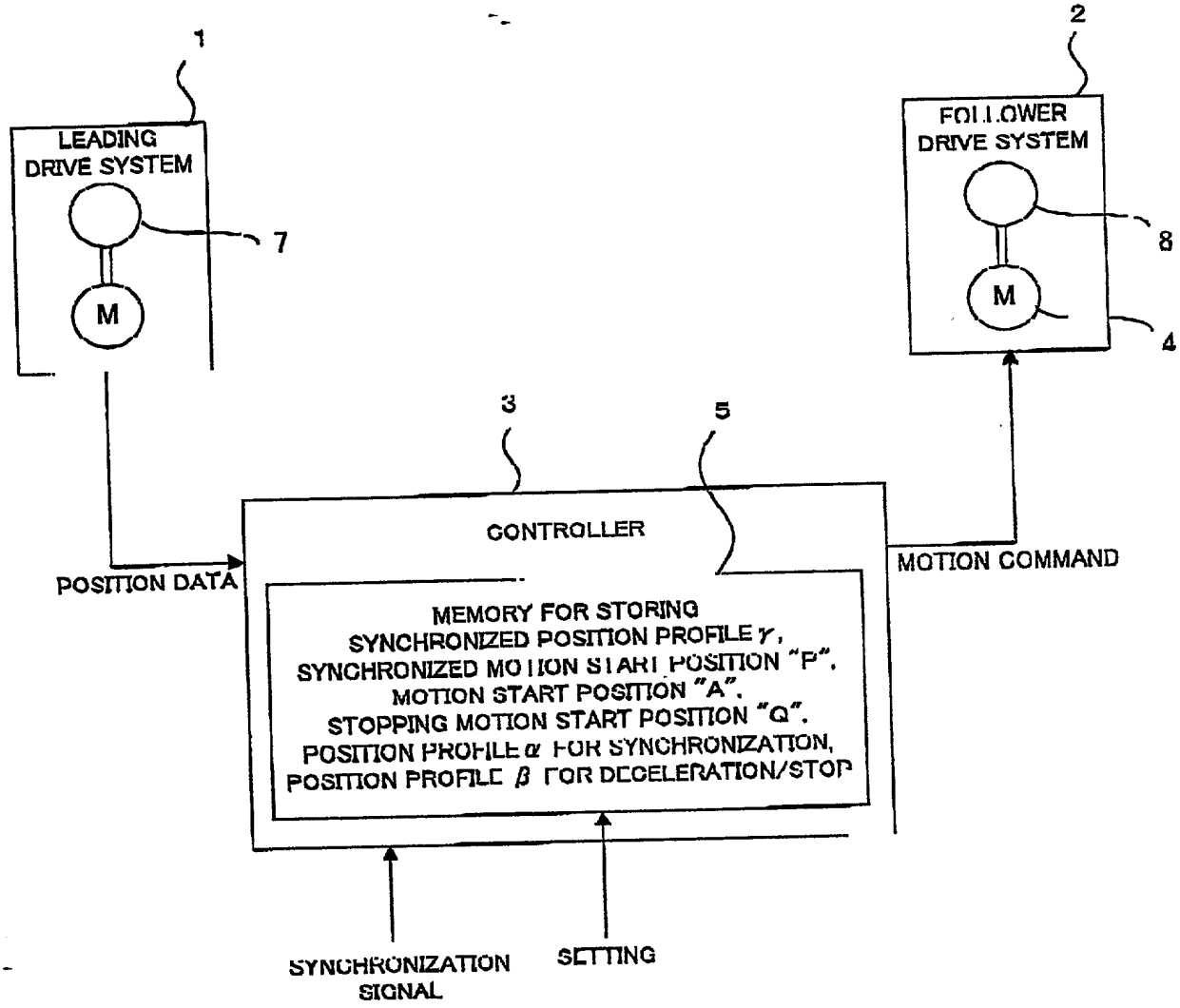

1
LEADING DRIVE SYSTEM
7
M
2
FOLLOWER DRIVE SYSTEM
8
M
4
3
5
CONTROLLER
MEMORY FOR STORING
SYNCHRONIZED POSITION PROFILE γ,
SYNCHRONIZED MOTION START POSITION "P",
MOTION START POSITION "A",
STOPPING MOTION START POSITION "Q",
POSITION PROFILE α FOR SYNCHRONIZATION,
POSITION PROFILE β FOR DECELERATION/STOP
POSITION DATA
MOTION COMMAND
SYNCHRONIZATION SIGNAL
SETTING

FIG.2a

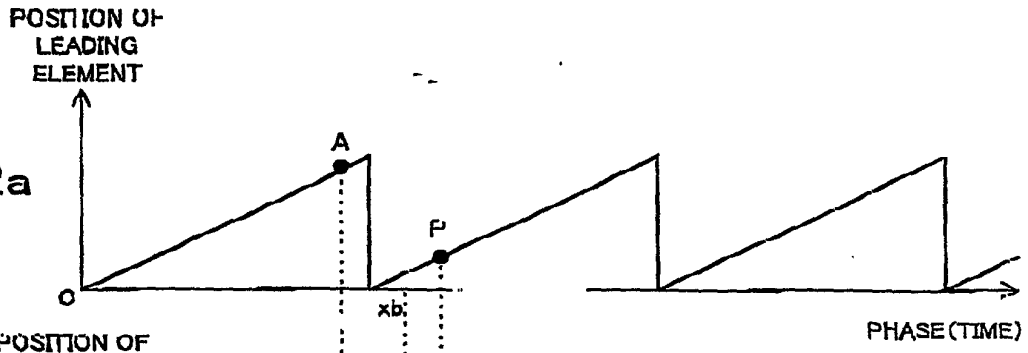



FIG.2b

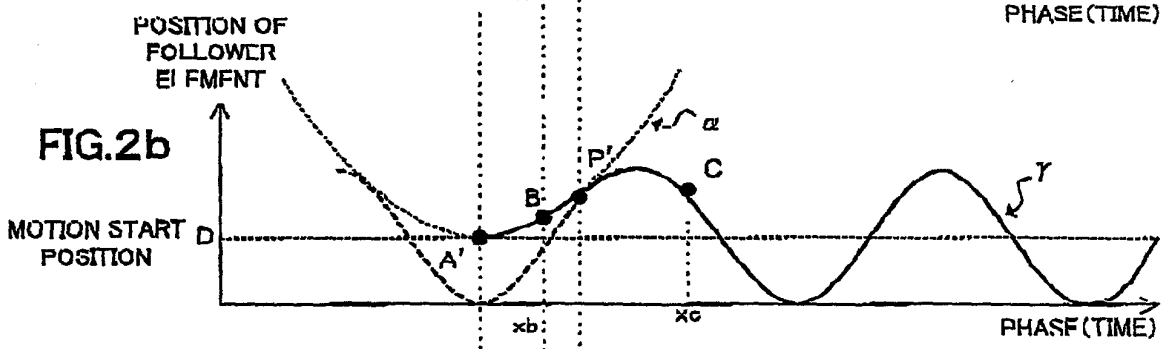



FIG.2c

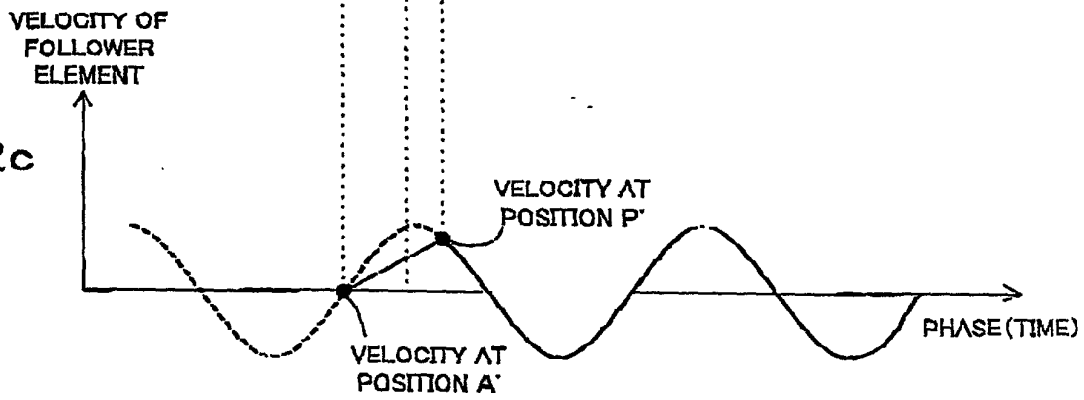


FIG.4a

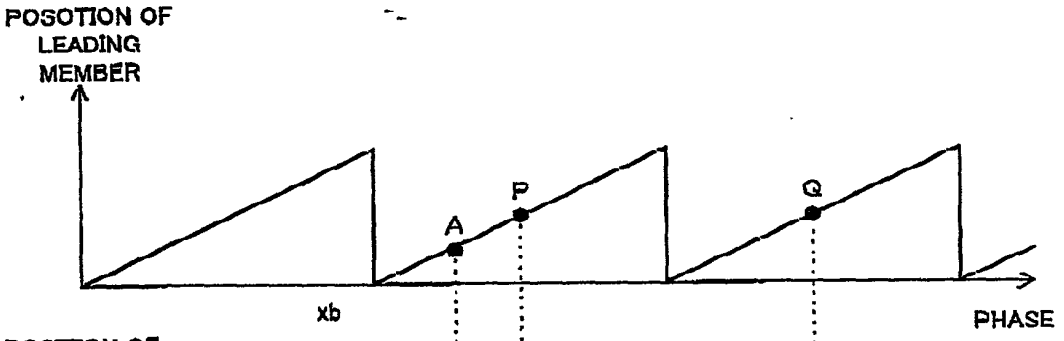



FIG.4b

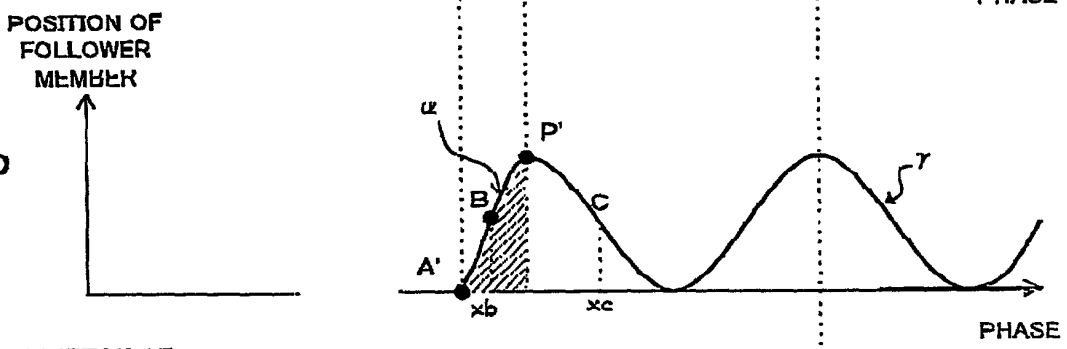



FIG.4c

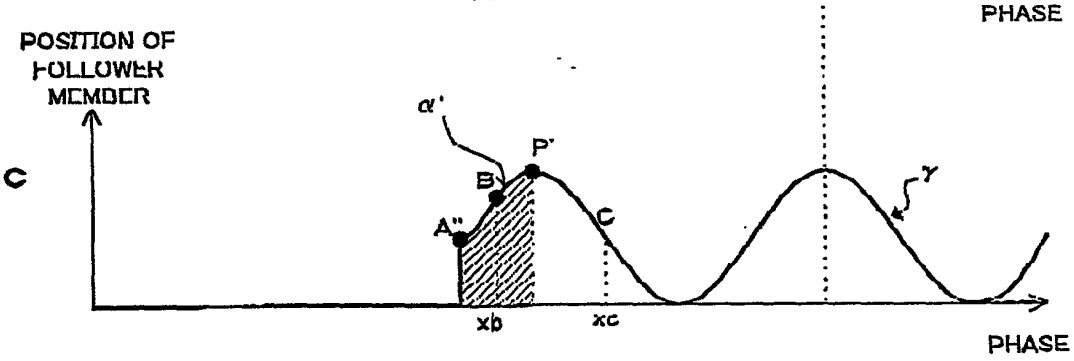


FIG.5

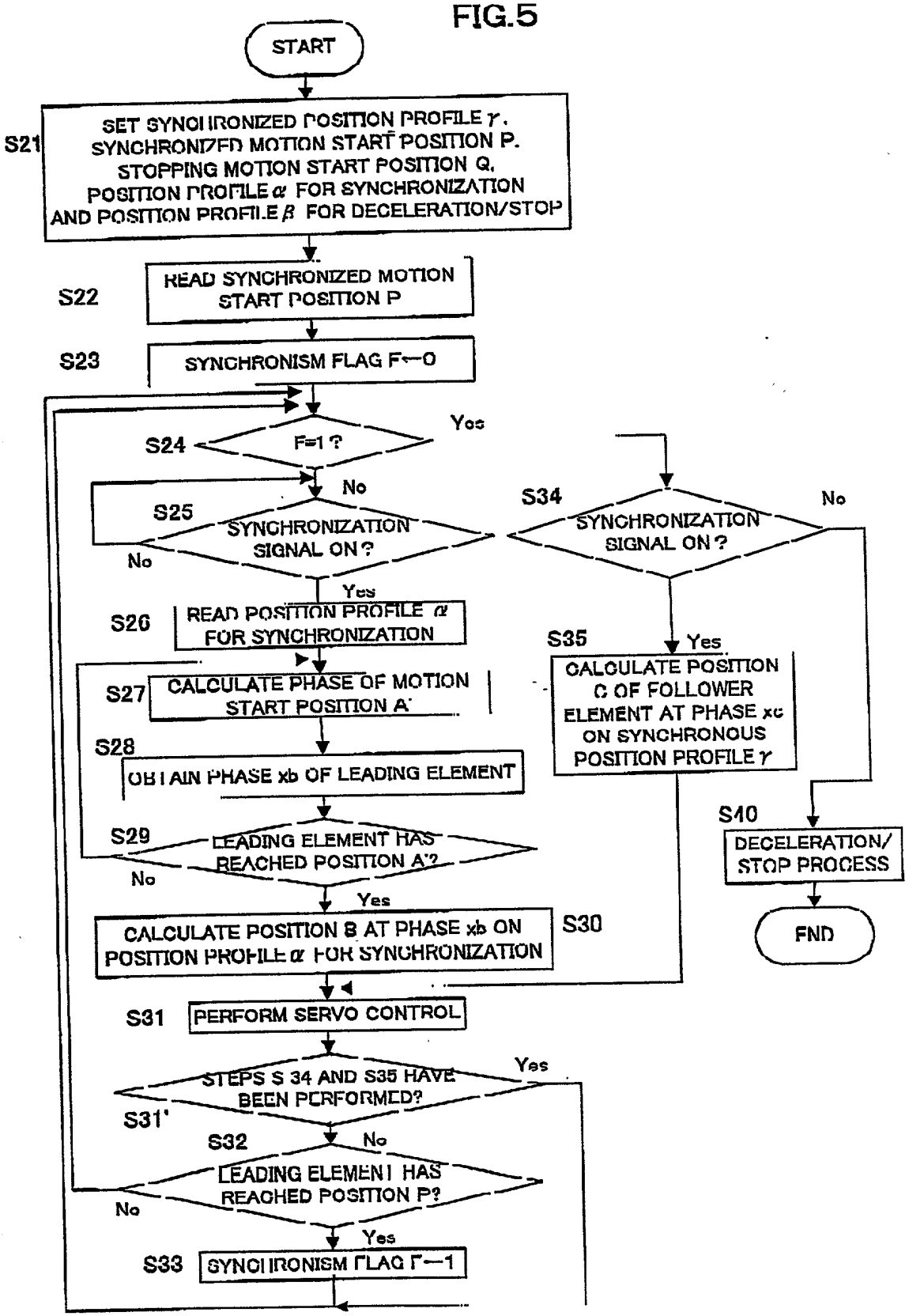

START
S21
SET SYNCHRONIZED POSITION PROFILE γ,
SYNCHRONIZED MOTION START POSITION P,
STOPPING MOTION START POSITION Q,
POSITION PROFILE α FOR SYNCHRONIZATION
AND POSITION PROFILE β FOR DECELERATION/STOP
S22
READ SYNCHRONIZED MOTION START POSITION P
S23
SYNCHRONISM FLAG F←0
S24
F=1 ?
Yes
No
S25
SYNCHRONIZATION SIGNAL ON ?
No
Yes
S26
READ POSITION PROFILE α FOR SYNCHRONIZATION
S27
CALCULATE PHASE OF MOTION START POSITION A'
S28
OBTAIN PHASE xb OF LEADING ELEMENT
S29
LEADING ELEMENT HAS REACHED POSITION A'?
No
Yes
S30
CALCULATE POSITION B AT PHASE xb ON POSITION PROFILE α FOR SYNCHRONIZATION
S34
SYNCHRONIZATION SIGNAL ON ?
No
S35
Yes
CALCULATE POSITION C OF FOLLOWER ELEMENT AT PHASE xc ON SYNCHRONOUS POSITION PROFILE γ
S10
DECELERATION/ STOP PROCESS
END
S31
PERFORM SERVO CONTROL
STEPS S 34 AND S35 HAVE BEEN PERFORMED?
Yes
S31'
S32
No
LEADING ELEMENT HAS REACHED POSITION P?
No
Yes
S33
SYNCHRONISM FLAG F←1

FIG.6a

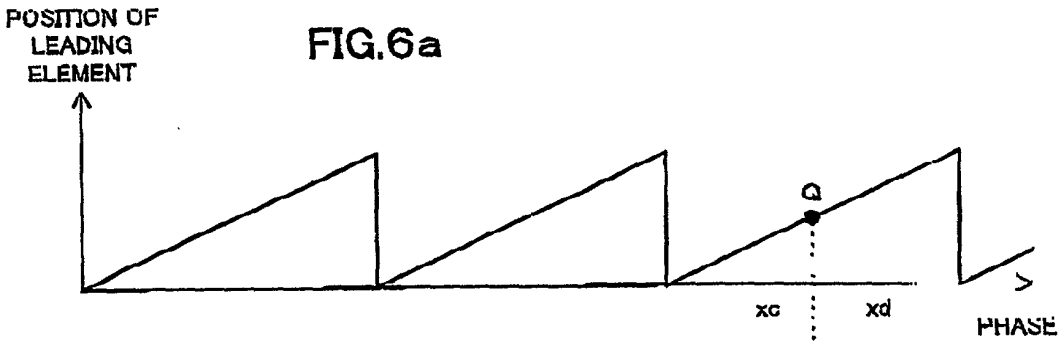

POSITION OF LEADING ELEMENT
Q
xc
xd
PHASE

FIG.6b

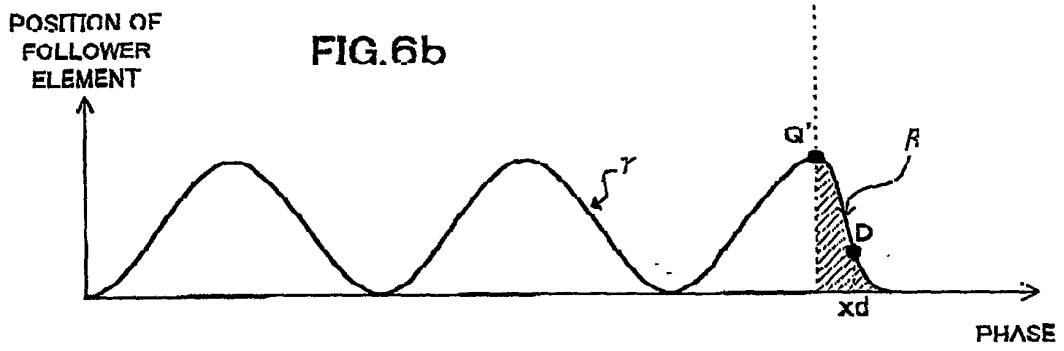

POSITION OF FOLLOWER ELEMENT
r
Q'
R
D
xd
PHASE

FIG.7

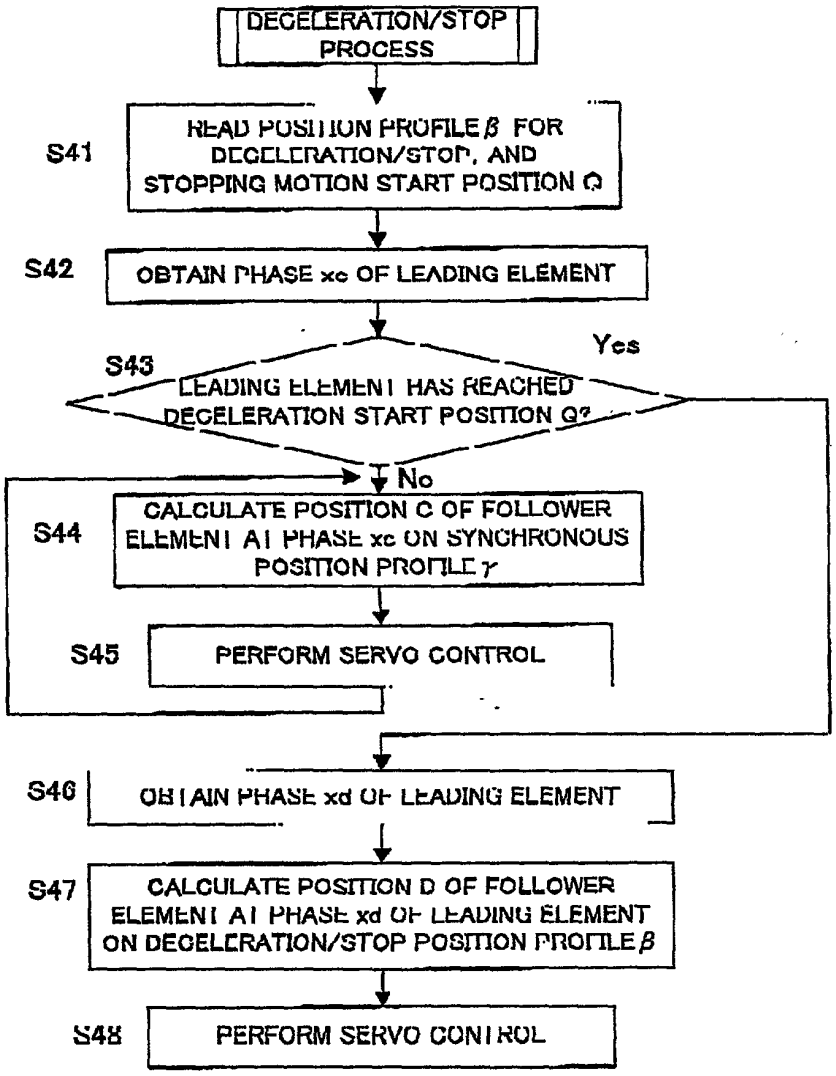

DECELERATION/STOP PROCESS
S41
READ POSITION PROFILE β FOR DECELERATION/STOP, AND STOPPING MOTION START POSITION Q
S42
OBTAIN PHASE xc OF LEADING ELEMENT
S43
LEADING ELEMENT HAS REACHED DECELERATION START POSITION Q?
Yes
No
S44
CALCULATE POSITION C OF FOLLOWER ELEMENT AT PHASE xc ON SYNCHRONOUS POSITION PROFILE γ
S45
PERFORM SERVO CONTROL
S46
OBTAIN PHASE xd OF LEADING ELEMENT
S47
CALCULATE POSITION D OF FOLLOWER ELEMENT AT PHASE xd OF LEADING ELEMENT ON DECELERATION/STOP POSITION PROFILE β
S48
PERFORM SERVO CONTROL

FIG.8a

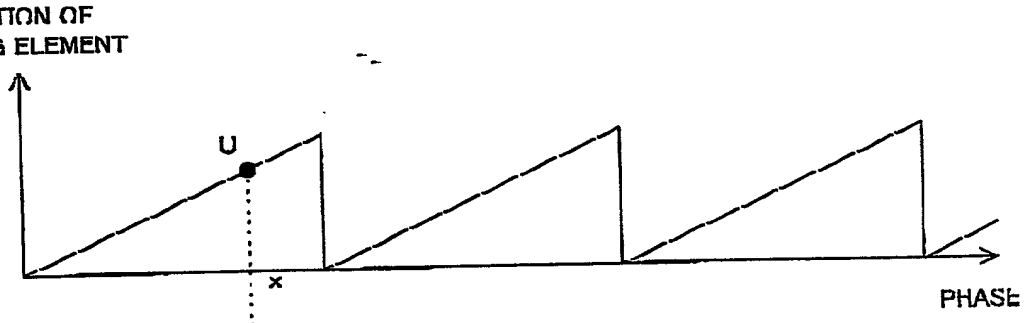



FIG.8b

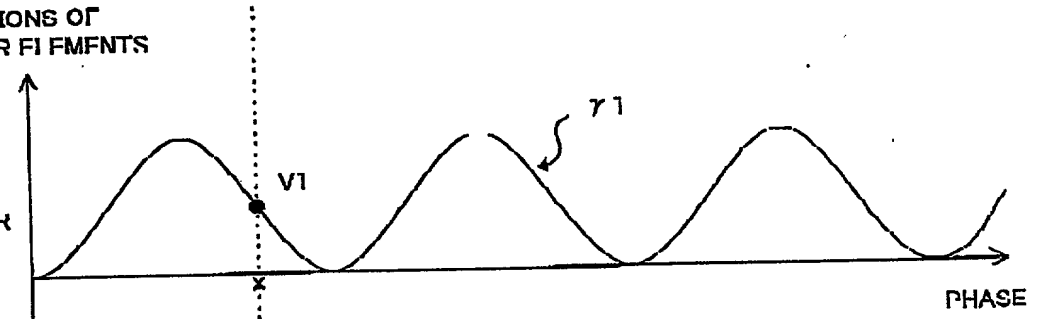



FIG.8c

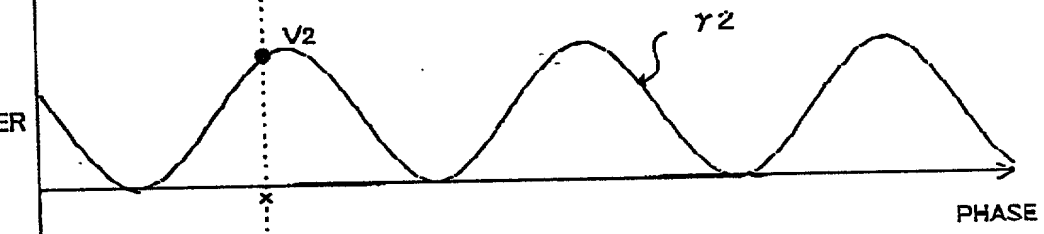



FIG.8d

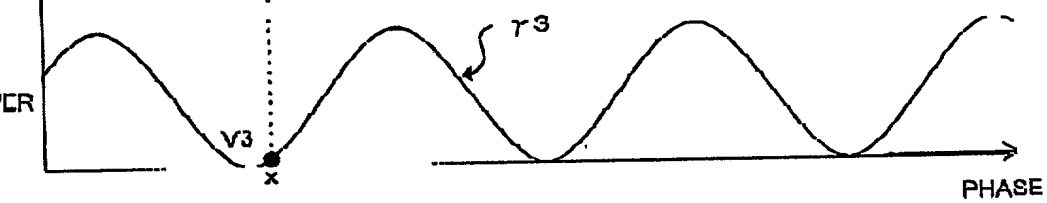


FIG.9

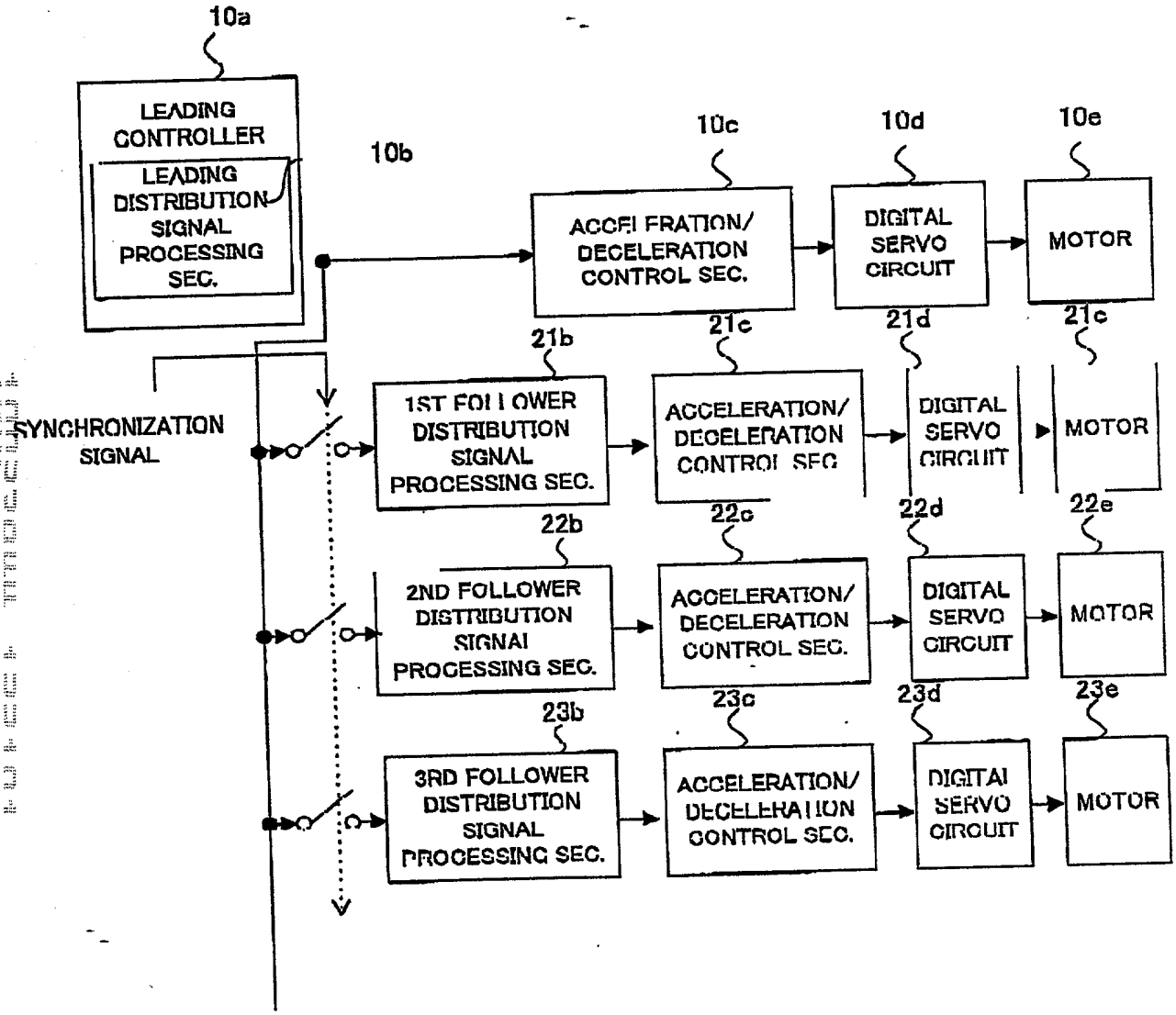

10a
LEADING CONTROLLER
LEADING DISTRIBUTION SIGNAL PROCESSING SEC.
10b
10c
10d
10e
ACCELERATION/ DECELERATION CONTROL SEC.
DIGITAL SERVO CIRCUIT
MOTOR
21b
21c
21d
21e
SYNCHRONIZATION SIGNAL
1ST FOLLOWER DISTRIBUTION SIGNAL PROCESSING SEC.
ACCELERATION/ DECELERATION CONTROL SEC.
DIGITAL SERVO CIRCUIT
MOTOR
22b
22c
22d
22e
2ND FOLLOWER DISTRIBUTION SIGNAL PROCESSING SEC.
ACCELERATION/ DECELERATION CONTROL SEC.
DIGITAL SERVO CIRCUIT
MOTOR
23b
23c
23d
23e
3RD FOLLOWER DISTRIBUTION SIGNAL PROCESSING SEC.
ACCELERATION/ DECELERATION CONTROL SEC.
DIGITAL SERVO CIRCUIT
MOTOR

FIG.10

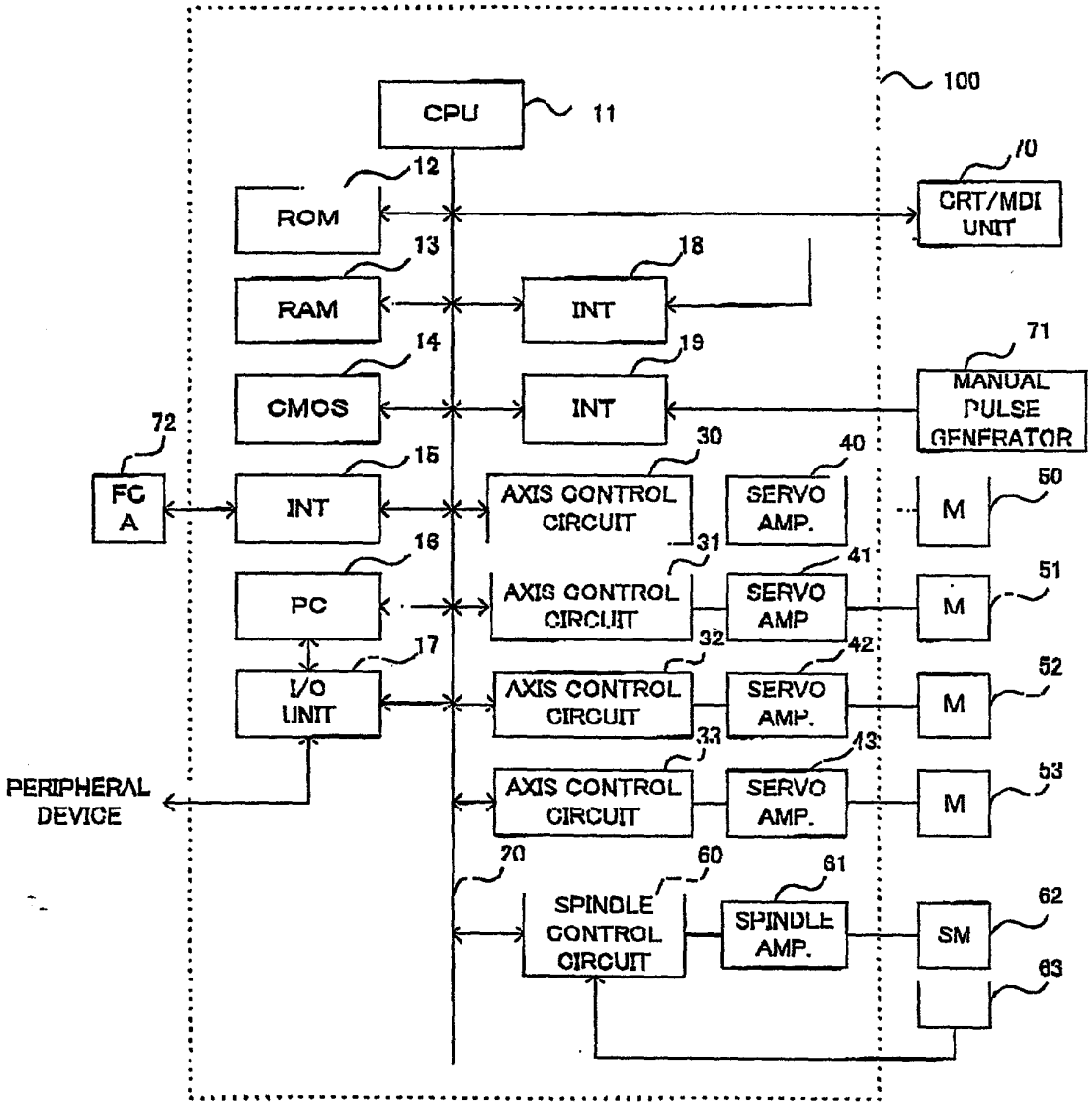
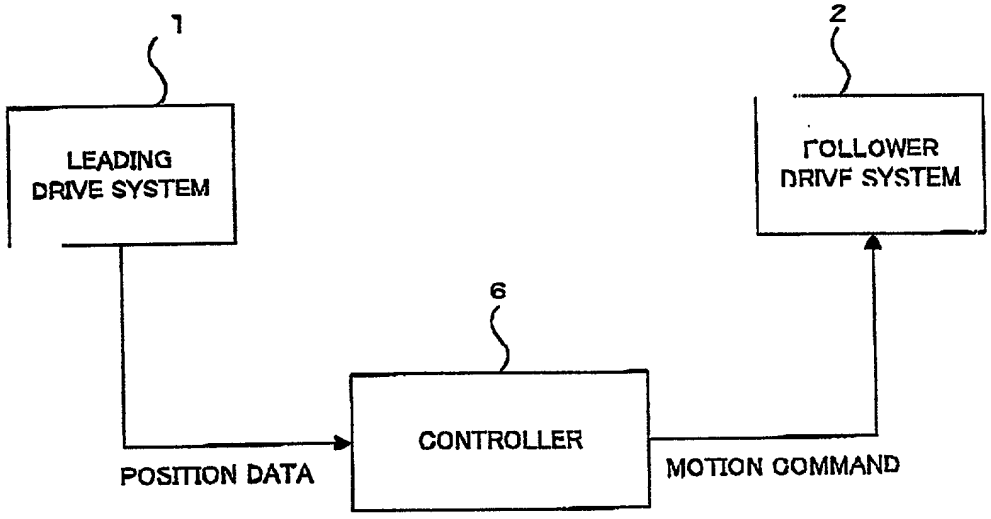

100
CPU
11
ROM
12
RAM
13
CMOS
14
INT
15
PC
16
I/O UNIT
17
FC A
72
PERIPHERAL DEVICE
INT
18
INT
19
AXIS CONTROL CIRCUIT
30
AXIS CONTROL CIRCUIT
31
AXIS CONTROL CIRCUIT
32
AXIS CONTROL CIRCUIT
33
SERVO AMP.
40
SERVO AMP
41
SERVO AMP.
42
SERVO AMP.
43
SPINDLE CONTROL CIRCUIT
60
SPINDLE AMP.
61
70
CRT/MDI UNIT
71
MANUAL PULSE GENERATOR
M
50
M
51
M
52
M
53
SM
62
63

FIG. 11


1
LEADING
DRIVE SYSTEM
2
FOLLOWER
DRIVE SYSTEM
6
CONTROLLER
POSITION DATA
MOTION COMMAND